

**Southern California Priority Corridor
Showcase Program Evaluation**

**Intermodal Transportation Management
Center/System (IMTMC/S) - ATMSi
Evaluation Report**

FINAL

November 24, 2004

Document No. 65A0030/0054
Task No. 5-7

Prepared for
California Department of Transportation
Division of Research & Innovation
1227 O Street
Post Office Box 942873
Sacramento, California 94273-0001

Prepared By
BOOZ ALLEN HAMILTON INC
1615 Murray Canyon Road, Suite 220
San Diego, California 92108

In Association with
CHEVAL RESEARCH INC
Post Office Box 3102
San Diego, California 92163

Table of Contents

DISCLAIMER	II
ABBREVIATIONS & ACRONYMS	III
EXECUTIVE SUMMARY	1
SHOWCASE PROGRAM BACKGROUND	1
EVALUATION FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS.....	4
1 INTRODUCTION	6
1.1 PURPOSE AND SCOPE OF THIS REPORT.....	6
1.2 EVALUATION DESIGN AND APPROACH	7
1.3 ORGANIZATION OF THIS REPORT	8
1.4 PRIVACY CONSIDERATIONS	9
1.5 CONSTRAINTS & ASSUMPTIONS	10
1.6 PROJECT BACKGROUND	10
2 PROJECT/SYSTEM TECHNICAL DESCRIPTION	13
2.1 INTRODUCTION TO PROJECT TECHNICAL TERMINOLOGY	13
2.2 IMTMC/S OVERVIEW.....	13
2.3 ATMSi COMPONENT OVERVIEW.....	15
3 SYSTEM PERFORMANCE EVALUATION	19
3.1 THE PROJECT/SYSTEM DEVELOPMENT PROCESS AND TIMELINE.....	19
3.2 IMPACT OF SHOWCASE INTEGRATION ON PROJECT DEPLOYMENT AND SYSTEM PERFORMANCE.....	26
4 COST EVALUATION	29
4.1 CONSTRAINTS & ASSUMPTIONS	29
4.2 PROJECT BUDGET & ESTIMATED DEVELOPMENT COSTS.....	29
5 INSTITUTIONAL IMPACTS EVALUATION.....	32
5.1 IMPACTS TO OPERATIONS AND MAINTENANCE POLICIES AND PROCEDURES.....	32
5.2 IMPACTS TO STAFFING/SKILL LEVELS AND TRAINING.....	32
5.3 IMPACTS TO THE COMPETITIVE ENVIRONMENT	33
5.4 IMPACTS TO LOCAL PLANNING PROCESSES, POLICY DEVELOPMENT, AND THE MAINSTREAMING OF ITS ..	33
6 TRAVELER AND TRANSPORTATION INFORMATION MANAGEMENT EVALUATION	35
7 TRANSPORTATION SYSTEM IMPACTS EVALUATION	36
CONCLUSIONS AND RECOMMENDATIONS.....	37
APPENDIX A – IMTMC/S-ATMSi INTERVIEW GUIDE.....	39
ENDNOTES/REFERENCES	44

Disclaimer

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California, Caltrans or the U.S. Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

Abbreviations & Acronyms

AIS	ATMS Intertie Server (see also ATMS)
AIWS	ATMS Integrated Work Station (see also ATMS)
ATIMS	Advanced Traveler Information Management System
ATIS	Advanced Traveler Information System
ATM	Asynchronous Transfer Method
ATMS	Advanced Transportation Management System
ATMSi	Advanced Transportation Management System - Intermodal
Caltrans	California Department of Transportation
CCTV	Closed-circuit Television surveillance camera
CHP	California Highway Patrol
CM	Configuration Management
CMP	Configuration Management Plan
CMS	Changeable Message Sign
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off-the-Shelf
CTC	California Transportation Commission
CVO	Commercial Vehicle Operations
CW	Corridor-wide
CWATIS	Corridor-wide Advanced Traveler Information System Project
CWATMS	Corridor-wide Advanced Transportation Management System Project
CWCVO	Corridor-wide Commercial Vehicle Operations Project
CWSIP	Corridor-wide Systems Integration Project
CWSP	Corridor-wide Strategic Planning Project
DRI	Caltrans, Division of Research & Innovation (formerly NTR)
EAP	Evaluation Activity Plan
EMC	Emergency Management Center
EP	Evaluation Plan
FHWA	Federal Highway Administration
FSR	Feasibility Study Report
FTA	Federal Transit Administration
FTE	Full-Time Equivalent (one full-time employee)
GPRA	Government Performance and Results Act
GUI	Graphical User Interface
HAT	Highway Advisory Telephone service
HP	Hewlett-Packard
HQIT	Headquarters - Information Technology (division of Caltrans)
HTML	Hypertext Mark-up Language
IDL	Interface Definition Language
IPR	Intellectual Property Rights
ISSC	Information Systems Service Center (division of Caltrans)
ISTEA	Intermodal Surface Transportation Efficiency Act (of 1991)
ITS	Intelligent Transportation Systems
LAN	Local Area Network

MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
MTBF	Mean Time Between Failure
MTDB	Metropolitan Transit Development Board
MVEM	Mission Valley Event Management
NDA	Non-Disclosure Agreement
NET	National Engineering Technology Corporation
NTCIP	National Transportation Communications for ITS Protocol
NTR	Caltrans Division of New Technology & Research (now DRI)
O&M	Operations and Maintenance
OCTA	Orange County Transportation Authority
OS	Operating system (such as Windows™, Unix, Linux, et. Al.)
PBF	Parsons-Brinkerhoff Farradyne
PC	Personal Computer (Windows™-based)
QUALCOMM	Qualcomm Stadium Authority
RAMS	Regional Arterial Management System
RFP	Request for Proposals
RIWS	Regional Integrated Workstation
RTP	Regional Transportation Plan
RTPA	Regional Transportation Planning Agency
RWS	Remote Workstation
SANDAG	San Diego Association of Governments
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCPCSC	Southern California Priority Corridor Steering Committee
SDPD	San Diego Police Department
SIP	Systems Integration Plan
SOW	Statement of Work
TEA-21	Transportation Equity Act for the 21 st Century
TMC	Transportation Management Center
TOC	Transportation Operations Center
TOSNET	Traffic Operations System Network
USDOT	United States Department of Transportation
VDS	Vehicle Detector Station or Vehicle Detection System
VMT	Vehicle Miles Traveled
VOS	Volume/Occupancy/Speed
WAN	Wide Area Network
XML	eXtensible Mark-up Language

Executive Summary

Showcase Program Background

As required by federal law, all Intelligent Transportation System (ITS) projects that receive federal funding must undergo an evaluation to help assess the costs and benefits of ITS. This document is one of 23 reports produced as part of the Southern California ITS Priority Corridor Showcase Program Evaluation to help planners and decision-makers at the federal, state and local levels make better-informed decisions regarding future ITS deployments. This report presents the experiences, costs, and lessons learned from the Advanced Transportation Management System - Intermodal (ATMSi) component of the Advanced Transportation Management System (ATMS) being developed for the San Diego region under the Intermodal Transportation Management Center and System (IMTMC/S) project.

In 1993, the U.S. Department of Transportation designated Southern California as one of four Priority Corridors in which ITS may have particular benefit. Southern California suffers from extreme traffic congestion, limited room for expanding transportation facilities, and above-average air pollution levels. The Southern California Priority Corridor is one of the most populated, traveled, and visited regions in the country, and consists of four adjoining regions:

- ▶ Los Angeles County and a part of Ventura County
- ▶ Orange County
- ▶ San Diego County
- ▶ Inland Empire (San Bernardino and Riverside Counties).

The ITS Showcase Program is one of several programs that have been implemented in Southern California's Priority Corridor to help aid mobility and mitigate traffic congestion and its associated environmental impacts. The Showcase Program consists of 17 ITS projects that collectively form a Corridor-wide intermodal transportation management and information network between Los Angeles, Orange County, San Diego, and the Inland Empire. Each Showcase project deploys a piece of this Corridor-wide ITS network, including regional Advanced Traveler Information Systems (ATIS), regional Advanced Transportation Management Systems (ATMS), and regional and interregional communications infrastructure. Eleven of the projects are regional in nature, while the remaining six are Corridor-wide. The IMTMC/S project is one of the eleven regional projects within the Southern California Priority Corridor ITS Showcase Program.

The IMTMC/S Project Background

The IMTMC/S project was initially conceived as part of the San Diego Regional ITS Strategic Plan in 1996. The project was awarded to National Engineering Technology (NET) Corporation and kicked off in January 1998. The IMTMC/S project is located in San Diego and provides intermodal transportation management data and field device monitoring and control via the regional IMTMS network and a single graphical user interface. The original RFP statement of work for this project includes incorporation and integration of the following modal subsystems:

- Freeway Management
- Transit Management
- Arterial Management
- Traveler Information Management
- Incident Management
- Commercial Vehicle/Border Operations

To achieve this broad spectrum of modal interconnections, the involvement of several other San Diego area transportation technology projects was required. Project subgroups have been formed to address each of the specific requirements of their respective modes. IMTMS overlaps with the following San Diego region projects to facilitate the connections to the regional network. IMTMC/S is responsible for the planning and design work for the regional architecture and the subgroup projects, shown in Exhibit 1, to ensure that the projects are all interoperable and communicate seamlessly across the network. Exhibit 1 provides the following information: (Column 1) the *modal system* required to be addressed by IMTMC/S, (Column 2) the *associated project or group* in the region that IMTMC/S must interface with, and (Column 3) the *subgroup agency* primarily responsible for management of the regional project or group, (Column 4), indicates if this project is also a *Showcase Program project*.

Exhibit 1 – IMTMC/S Project Subgroups

Modal System	Associated Project or Group	Subgroup Agency	Showcase Program Project?
Freeway Management	Advanced Transportation System – Intermodal (ATMSi)	SANDAG/Caltrans District 11	Yes
Transit Management	Regional Transit Management System (RTMS) Project	SANDAG	No
	Regional Advanced Vehicle Location (RAVL) Project, Transit Demonstration	SANDAG	Yes
Traveler Information Management	San Diego Advanced Traveler Information System Project	SANDAG	No
Incident/Event Management	Incident & Event Management subgroup	CHP Border Division, Caltrans District 11	No
CVO/Borders	Commercial Vehicle and International Border Freight Advisory Committee (inactive)	SANDAG	Yes
Communications/IMTMS Network	Communications Subgroup	Caltrans District 11	Yes

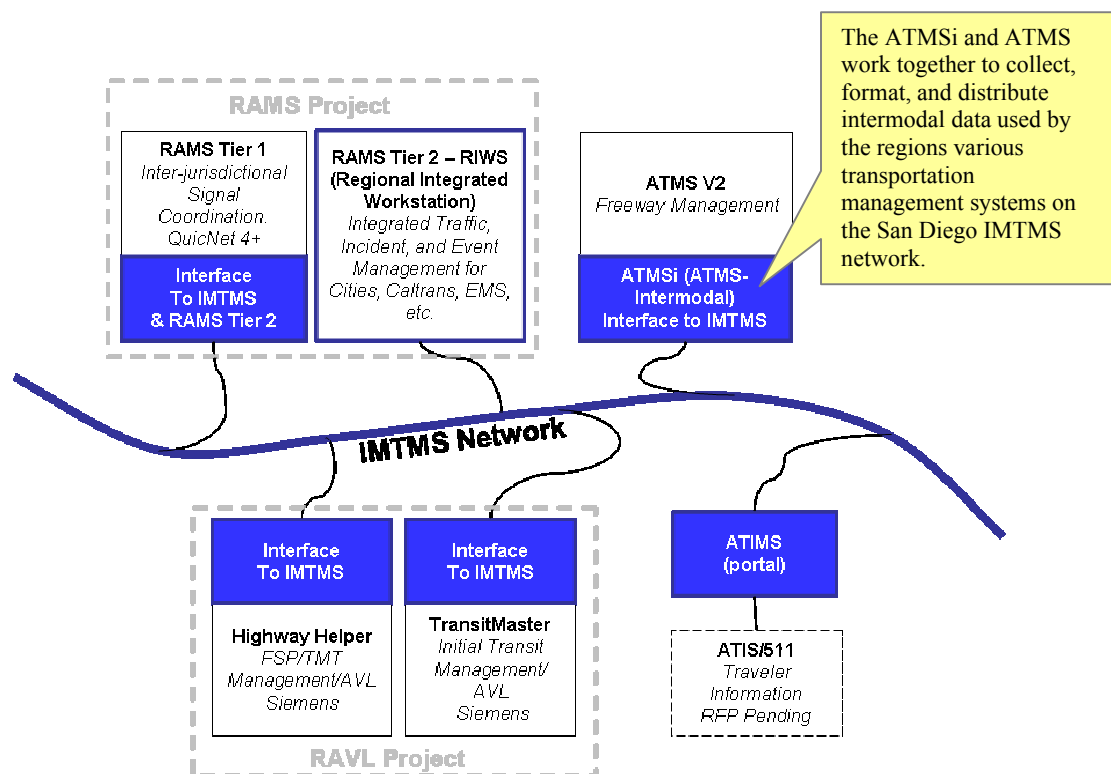
In order to accomplish the connection between the various modal systems in the region, a common computer application or operating system must be used by all transportation technology projects and their managing agencies that wish to communicate across to the regional network.

The operating system used at the Caltrans and CHP transportation management centers (TMCs) is known as the Advanced Transportation Management System (ATMS). A version of the ATMS application was designed, developed and deployed for Caltrans District 7 and is currently in its second version. ATMS version 2 (ATMS2) was chosen for subsequent deployment at San Diego's regional Caltrans District 11/CHP TMC under the IMTMC/S project. A module of ATMS2 is the Intermodal Advanced Transportation Management System (ATMSi). The ATMSi is integrated with other IMTMS hardware and software, and facilitates the exchange of regional intermodal data with participating stakeholders and supporting infrastructure.

The primary objective of the ATMSi is to enhance the baseline ATMS2 to support intermodal operations in the San Diego region. The core element of the ATMSi is the implementation of an Intertie capability between Caltrans District 11 and other local agencies within the San Diego region. Intertie functions include sharing of information, status and – based on inter-agency agreements – control of selected field elements, such as changeable message signs (CMSs), closed circuit television (CCTV) cameras, signal systems, etc. The ATMSi has been the focus of the IMTMC/S evaluation activities and is the subject of this evaluation report.

The ATMSi provides the intermodal connection for the ATMS to the San Diego regional IMTMS network. A high-level depiction of the IMTMS network and the various connections for each of the modal groups is shown in Exhibit 2.

Exhibit 2 – IMTMS Network and Modal Connections



Evaluation Findings, Conclusions, and Recommendations

The IMTMC/S-ATMSi project is expected to enhance and promote the concept of a common system for sharing, display, and control of transportation system field devices in the San Diego region. Project partners are positive about the potential benefits of the regional IMTMS network and the distribution of the regional system to local agencies.

The ATMSi and IMTMC/S projects have provided essential, pivotal support to other regional Showcase projects through common design, engineering, and integration assistance for the IMTMS network. The intricacy of the relationships with other regional and inter-regional Showcase projects has introduced complex dependencies that have caused periodic delays to the development of the ATMSi and IMTMS network.

The IMTMC/S project is being conducted under a task order contract for \$8,402,209 and was funded by a variety of grants derived from federal, state, and local sources. Among the current delays to progress on the project, is the interruption in the approval of Work Order 6, which will allow the system developer to complete the ATMSi component of the IMTMC/S project. Approval of the work order is pending the resolution of continuing funding uncertainties.

The IMTMC/S project's impact to the competitive environment in San Diego will be unclear until the systems are fully deployed. Documentation and standards that can be easily accessed and applied by future system developers will assist in maintaining healthy competition in the region.

The IMTMC/S, ATMSi and regional ITS have benefited from regional collaboration in project planning and implementation, and have been challenged by changes in local agency responsibilities. Continuing progress and ultimately closure on this phase of the project will be achieved through strong project management, clear identification and application of funding, and expedited approval of current the work order. Previous delays in the project have resulted in changes in scope over time to accommodate continuously evolving and improving technology.

The evaluation has identified some potential actions to assist in mitigating delays that inhibit project progress. The following recommendations are general and are potentially applicable to any project with similar regional application and organization structure:

- Adoption of a project management standard that includes a structured deliverable document review process – the outcome would be more efficient and expedited deliverable document review cycles.
- Suitable workload adjustments for public agency staff responsible for technology project management – adoption of a project management standard would allow more accurate estimates of time required to monitor and manage a technology project.

- Allocation of time for project managers to attain an appropriate level of technical expertise with regard to their project's systems, software, or hardware – historically project managers have not had enough time to come up to speed on their project technologies in addition to conducting their regular project management tasks and deliverable reviews. Alternatively, agencies could provide the project managers with appropriate support staff possessing the applicable technical expertise to support the management of projects of this type.
- Consensus building, procedure development, and policy formation, are time consuming factors in the design, development, and deployment of regional projects that include multiple agencies and jurisdictions. Subsequent projects in the San Diego will benefit from the regional architecture completion. Groundbreaking consensus building has already occurred with this project, RAMS, Mission Valley Event Management (MVEM), and others. Few previous precedents or models were available for projects of these types; now that the San Diego area has regional, cross-jurisdictional projects that have undertaken these challenges, the policies, procedures, and consensus-building lessons learned should be reemployed in future projects.

Additionally, based on project partner recommendations, the following elements have been identified as essential in ensuring the success and usefulness of this and future regional transportation technology projects:

- Expedited turn-around on work order approvals,
- Expedited turn-around on deliverable reviews and approvals,
- Frequent multi-phase acceptance testing to assist with project understanding,
- Strong support from regional leaders, encouraging interest and use from operations management and staff,
- Consistent involvement of operations staff in the development process,
- Strong project financial management, and
- Organized deliverable document archiving.

1 Introduction

1.1 Purpose and Scope of this Report

As required by federal law¹, all Intelligent Transportation System (ITS) projects that receive federal funding must undergo an evaluation to help assess the costs and benefits of ITS. The information provided in this report is intended to help planners and decision-makers at the federal, state and local levels make better-informed decisions regarding future ITS deployments based on the experiences of Southern California's Intermodal Transportation Management Center/System – ATMSi project.

This document is one of 23 reports produced as part of the Southern California ITS Priority Corridor Showcase Program Evaluation, and covers only the events and findings resulting from the ATMSi evaluation (shown below as the *IMTMC Project Report*). The complete findings from the Showcase Program Evaluation are found in the following collection of documents:

Document Type/Title	Date	Document Number
17 Individual Project Evaluation Reports		
Corridor-wide ATIS Project Report	7/16/2003	65A0030/0033
Corridor-wide ATMS Project Report	10/28/2004	65A0030/0049
Corridor-wide CVO Project Report	10/29/2004	65A0030/0051
Corridor-wide Rideshare Project Report	11/1/2004	65A0030/0048
Corridor-wide Strategic Planning Project Report	10/29/2002	65A0030/0028
Fontana-Ontario ATMIS Project Report (draft)	11/11/2004	65A0030/0047
IMAJINE Project Report	3/17/2003	65A0030/0029
IMTMC/S Project Report	11/24/2004	65A0030/0054
InterCAD Project Report	4/2/2003	65A0030/0030
Kernel Project Report	5/30/2003	65A0030/0031
LA ATIS Project Report	7/18/2003	65A0030/0038
Mission Valley ATMIS Project Report	11/12/2004	65A0030/0050
Modeshift Project Report	10/28/2004	65A0030/0052
OCMDI Project Report	2/20/2004	65A0030/0040
Traffic Signal Integration Project Report	11/23/2004	65A0030/0055
Transit Mgt System Project Report (draft)	10/19/2004	65A0030/0053
TravelTIP Project Report	6/3/2003	65A0030/0036
5 Cross-Cutting Evaluation Reports		
System Performance Cross-Cutting Report (draft)	11/11/2004	65A0030/0056
Costs Cross-Cutting Report	TBD	65A0030/0057
Institutional Issues Cross-Cutting Report (draft)	11/15/2004	65A0030/0058
Information Management Cross-Cutting Report (draft)	11/18/2004	65A0030/0059
Transportation System Impacts Cross-Cutting Report (draft)	11/22/2004	65A0030/0060
Final Summary Evaluation Report		
Showcase Program Evaluation Summary Report	TBD	65A0030/0061

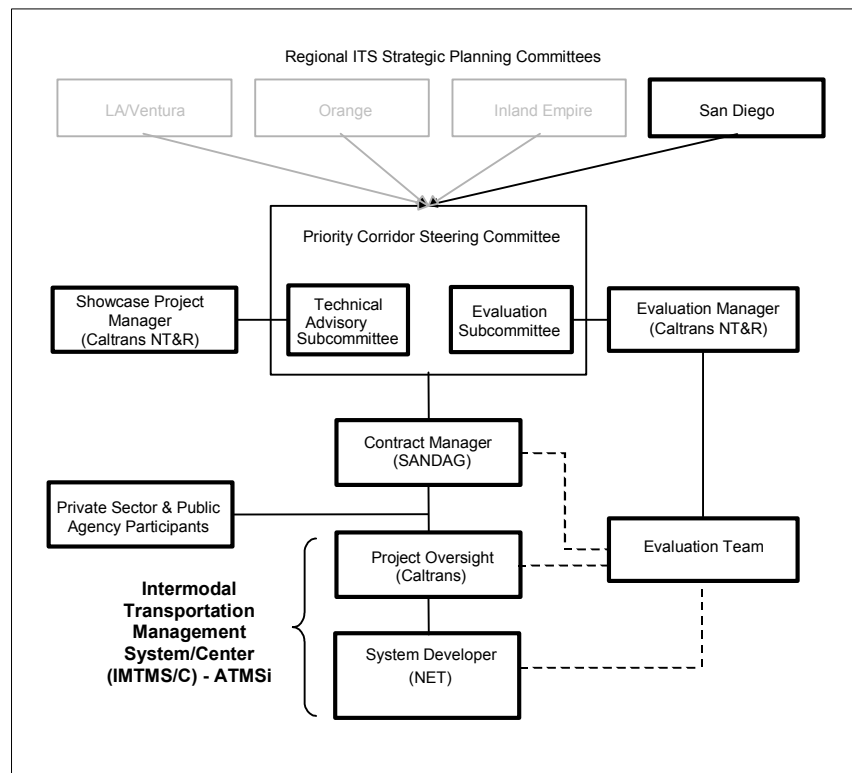
"TBD" indicates a future deliverable that is not yet available.

1.2 Evaluation Design and Approach

The findings outlined in this report are based on 8 years of personal observations at project meetings, reviews of released project documents and agency memos, analysis of collected quantitative data, as well as formal and informal interviews and discussions with project partners.

The evaluation is responsive to the needs and suggestions of the Priority Corridor's Evaluation Subcommittee, which reports to the Priority Corridor's Steering Committee. As shown in Exhibit 3, both committees are comprised of stakeholders from the federal, state, and local levels.

Exhibit 3 – Management Structure and Organization of the Showcase Program and the IMTMC/S Project



The Steering Committee's member agencies reflect wide representation from the region in terms of federal and state highway agencies, public safety, cities and counties, transit, air quality and regional planning entities, including:

- ▶ California Highway Patrol (CHP)
- ▶ Caltrans, Division of Traffic Operations (headquarters)*
- ▶ Caltrans, District 7*
- ▶ Caltrans, District 8*
- ▶ Caltrans, District 11*

- ▶ Caltrans, District 12
- ▶ City of Irvine*
- ▶ City of Los Angeles Department of Transportation (LADOT)
- ▶ City of San Diego
- ▶ Federal Highway Administration (FHWA)*
- ▶ Federal Transit Administration (FTA)
- ▶ Los Angeles County Metropolitan Transportation Authority (MTA)
- ▶ Orange County Transportation Authority (OCTA)
- ▶ Riverside County Transportation Commission (RCTC)
- ▶ San Bernardino Association of Governments (SANBAG)
- ▶ San Diego Association of Governments (SANDAG)
- ▶ South Coast Air Quality Management District (SCAQMD)
- ▶ Southern California Association of Governments (SCAG).

* Indicates an Evaluation Subcommittee member

The Showcase Program's Evaluation Design is based on a set of evaluation Goals and supporting Objectives and Measures that were developed by the Evaluation Team in partnership with federal, state and local stakeholders, and documented in the "Showcase Program Evaluation Approach" in 1998. Each individual Showcase project is evaluated based on an applicable subset of these Goals, Objectives, and Measures in order to help ensure that summary evaluation results can be aggregated from across the multiple Showcase project evaluations. The Showcase Program's five evaluation Goals include:

- ▶ Evaluate System Performance
- ▶ Evaluate Costs
- ▶ Evaluate Institutional Issues and Impacts
- ▶ Evaluate the Use and Management of Transportation/Traveler Information
- ▶ Evaluate Transportation System Impacts.

As the IMTMC/S and ATMSi projects evolved, project-specific refinements to the evaluation design were documented in a high-level Evaluation Plan (EP) and a detailed Evaluation Activity Plan (EAP). In general, the EP describes the project and/or system under evaluation, and lays the foundation for further evaluation activities by developing consensus among the Evaluation Subcommittee and project partners as to which of Showcase's evaluation Goals, Objectives, and Measures best apply to the project.

As the project matured, and after the EP had been approved, an EAP was developed to plan, schedule, and describe specific activities (interviews, surveys, etc.) and step-by-step procedures for conducting the evaluation. Data collection began after both plans had been reviewed and subsequently approved by the Evaluation Subcommittee and the project's partners.

1.3 Organization of this Report

The IMTMC/S Evaluation Report provides a background description of the Southern California Priority Corridor and the transportation challenges facing San Diego County. This is followed by descriptions of the Showcase Program and the IMTMC/S project and the subject ATMSi

component, including a detailed technical description. The evaluation itself is subdivided and ordered into the five topic areas described below:

System Performance — normally provides important benchmark information regarding system availability, reliability, scalability and compatibility. The ATMSi project was still in the development stage, not fully deployed, during the period of this evaluation. A standard evaluation of system performance was not performed for this project; however, important information regarding the system planning, design, and development process to date has been included in this section.

Cost — provides important benchmark information regarding funding sources, software licensing, development costs, costs to re-deploy elsewhere or expand the system, and operations and maintenance (O&M) costs. This report includes an estimate of costs to deploy ATMSi "from scratch" elsewhere in the State, and also looks at the incremental costs for integrating additional partner agencies. Costs incurred to date include those associated with the system planning, design, and development process through the first release of ATMSi. Full deployment costs are estimated and are based on planned project budgets, valuations, and approximations based on the experience of project partners and system developers.

Institutional Impacts — provides important information regarding the administrative, procedural and legal impacts resulting from the deployment of ATMSi. Such impacts include changes in operator responsibilities, as well as changes and limitations of agency-wide policies, procedures and guidelines. This section will focus on issues and impacts occurring during the planning, design, and development process.

Transportation & Traveler Information Management — normally provides important benchmark information on system usage and user acceptance (by both agency operators and the general public). This report provides qualitative findings on those items and can be used to identify user demand, needed improvements and potential areas of future growth. Among the recommendations in this report, is to conduct a full evaluation of the final transportation information management capabilities of ATMSi once the system is fully deployed.

Transportation System Impacts — normally provides important information regarding systems impacts on transit usage, traffic congestion, air quality, and traffic safety. During the period of this evaluation, the system remained development phase and therefore, transportation system impacts could not be measured. Among the recommendations in this report, is to conduct a full evaluation of system impacts at a future time once the system is fully deployed.

The report concludes with a summary, final remarks and recommendations for next steps. An Appendix contains a copy of the evaluation data collection instrument used (i.e., a blank questionnaire).

1.4 Privacy Considerations

Some of the information acquired in the interview and discussion process could be considered sensitive and has been characterized in this report without attribution. The Evaluation Team has

taken precautions to safeguard responses and maintain their confidentiality. Wherever possible, interview responses have been aggregated during analysis such that individual responses have become part of a larger aggregate response. The names of individuals and directly attributable quotes have not been used in this document unless the person has reviewed and expressly consented to its use.

1.5 Constraints & Assumptions

The ATMSi evaluation is subject to the following constraints and assumptions:

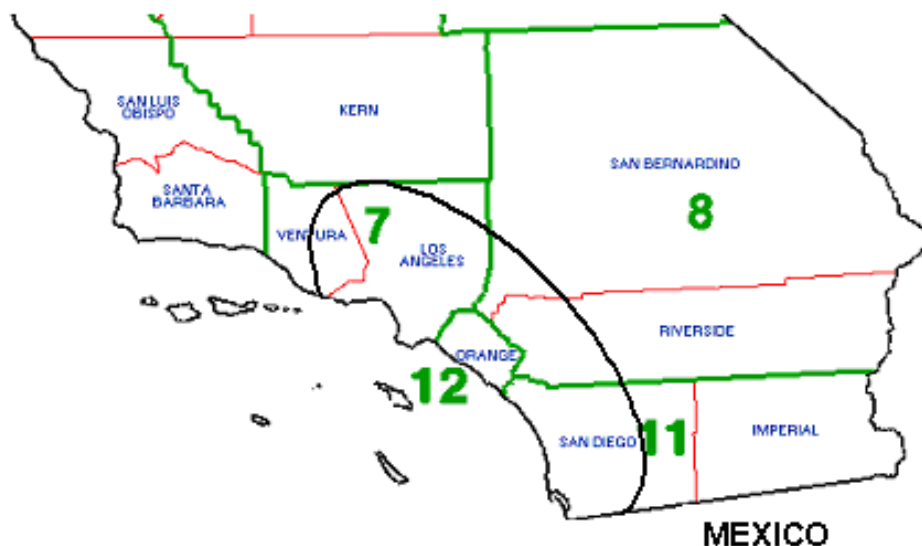
- ▶ The project's consultant was not required to disclose actual project expenses, so the project's cost is based on system developer invoices and the task order budgets stipulated in the ATMSi contract and its amendments. The budget reflects the expenses and costs for services paid by the client agency, but not necessarily the actual detailed costs for goods and services borne by the contractor.

1.6 Project Background

1.6.1 The Southern California Priority Corridor

In 1993, the U.S. Department of Transportation designated Southern California as one of four Priority Corridors in which Intelligent Transportation Systems (ITS) could have particular benefit. Southern California suffers from extreme traffic congestion, limited room for expanding transportation facilities, and above-average air pollution levels. The Southern California Priority Corridor, illustrated in Exhibit 4, is one of the most populated, traveled, and visited regions in the country.

Exhibit 4 – The Southern California Priority Corridor and Vicinity



The Southern California Priority Corridor consists of four distinct regions that correspond with the four Southern California Caltrans districts:

- ▶ Los Angeles/Ventura (Caltrans District 7)
- ▶ Orange County (Caltrans District 12)
- ▶ San Diego County (Caltrans District 11)
- ▶ Inland Empire (Caltrans District 8).

Roughly two-thirds of the state's population – about 20 million people – resides in or around the Southern California Priority Corridor. A breakdown of the population, registered vehicles by County and Caltrans District is shown in Exhibit 5.

Exhibit 5 – Population and Number of Registered Vehicles by County

County	Population² (as of 1/1/2003)	Registered Vehicles^{3*} (as of 12/31/2002)	Caltrans District
Los Angeles	10 million	6.7 million	7
Orange	3 million	2.2 million	12
San Diego	3 million	2.3 million	11
San Bernardino	1.8 million	1.3 million	8
Riverside	1.7 million	1.2 million	8
Ventura	0.8 million	0.7 million	7
Imperial	0.15 million	0.1 million	11
Total	20.5 million	14.5 million	

*Includes autos, trucks, and motorcycles. Trailers not included.

1.6.2 The Southern California Priority Corridor's ITS Showcase Program

The ITS Showcase Program is one of several programs that have been implemented in Southern California's Priority Corridor to help aid mobility and mitigate traffic congestion and its associated environmental impacts.

Exhibit 6 lists the 17 ITS projects in the Showcase Program. These projects collectively form a Corridor-wide intermodal transportation management and information network between Los Angeles, Orange County, San Diego, and the Inland Empire. Eleven of the projects are regional in nature, while the remaining six are Corridor-wide in scope.

The ATMSi project (shown below as the IMTMC/S (ATMSi) project) became one of the 17 projects that comprise the Southern California Priority Corridor ITS Showcase Program. The 17 Showcase projects are listed below by region. Eight of the projects were fast-tracked and designated "Early Start" projects because of their importance as base infrastructure and potential to act as role models for the rest of the Showcase Program. The Showcase Program funded the ATMSi component of the IMTMC/S project. Additional project phases and functionality are planned for the near future and are funded through other sources.

Exhibit 6 – The 17 Showcase Projects and their Status as of October 2004

Project	RFP Issued	Contractor Selected	Contract Executed	Project Underway	Project Complete
Corridor-wide					
Scoping & High Level Design (Kernel)*	✓	✓	✓	✓	✓
Strategic Planning/Systems Integration	✓	✓	✓	✓	✓
CVO					
ATIS	✓	✓	✓	✓	✓
ATMS					
Rideshare	✓	✓	✓	✓	✓
Los Angeles Region					
IMAJINE*	✓	✓	✓	✓	✓
Mode Shift*	✓	✓	✓	✓	✓
LA ATIS	✓	✓	✓	✓	✓
Inland Empire Region					
Fontana-Ontario ATMIS	✓	✓	✓	✓	✓
Orange County Region					
TravelTIP*	✓	✓	✓	✓	✓
OCMDI	✓	✓	✓	✓	✓
San Diego Region					
InterCAD*	✓	✓	✓	✓	✓
Mission Valley Event Management*	✓	✓	✓	✓	✓
IMTMC/S (ATMSi)*	✓	✓	✓	✓	
Traffic Signal Integration (RAMS)	✓	✓	✓	✓	
Transit Management System*	✓	✓	✓	✓	

* Indicates an "Early Start" project.

☐ CWCVO and CWATMS do not yet have approved work plans.

2 Project/System Technical Description

2.1 Introduction to Project Technical Terminology

Before describing the IMTMC/S and ATMSi project system and architecture, a brief description of two terms commonly used in the context of San Diego regional ITS projects, and this project in particular, may provide some helpful background and context for the remainder of the discussion in this and the following sections.

Mode A method of transportation for moving people or carrying cargo from one location to another. In the context of this project, modes include transit systems, freeway systems, arterial traffic signal systems, and international borders.

Intermodal The use or interaction of more than one method of transportation. Generally, places or systems where different transportation modes interact, such as a station people or cargo off of one mode and onto another.

In the context of this project, intermodal applies to a computer application for managing transportation system information for a variety of transportation modes and field devices in the San Diego region. The computer system manages, provides, or exchanges information or data about multiple methods of transportation and the networks and devices that support the transportation modes.

Example: System may provide traffic signal system information about arterial traffic signal systems, transit vehicle locations, traffic congestion information from regional freeways, and information from other modes, transportation facilities, or field devices collected onto a single computer user interface.

2.2 IMTMC/S Overview

The ATMSi component of the Intermodal Transportation Management Center/System (IMTMC/S) project is intended to provide the San Diego region with intermodal management system data exchange, data sharing, and networking capabilities. The existing primary transportation management systems in the region focus on freeways and are operated by Caltrans from the regional Transportation Management Center (TMC). The IMTMC/S expands upon these systems and integrates the modal management systems to support regional intermodal and multimodal functions. The IMTMC/S project was originally conceived as part of the San Diego Region ITS Strategic Plan in 1996 and was awarded and kicked off in January 1998.

The IMTMC/S Project is a two-phase project that includes planning, development, and deployment. Phase 1 encompasses requirements analysis (for users, systems, and graphical user interfaces), high-level design, and regional agreements. The regional agreements have been replaced by the agreement structure suggested in the adopted San Diego Regional ITS System Architecture. Phase 2 encompasses detailed design, prototype development and test, prototype operations, and final system implementation.

The IMTMC/S consists of transportation management system operating system software and hardware, the supporting network software, hardware and cabling infrastructure and the interface to and integration with other regional project's systems. The regional TMC, operated by California Highway Patrol Border Division and Caltrans District 11, is the location of the Intermodal Transportation Management Center (IMTMC). The IMTMC is ultimately expected to exchange information with all modes of the region's Intermodal Transportation Management System (IMTMS), consisting of freeway management, arterial streets management, transit management, commercial vehicle and border operations, incident management, event management, and advanced traveler information systems.

2.2.1 IMTMC/S Project Organization

To achieve this broad spectrum of modal interconnections, project subgroups have been formed to address each of the specific requirements of their respective modes. Project sub-groups for the IMTMC/S have been formed by associated projects in the San Diego region, such that development, deployment and integration of the sub-group project systems coordinates with the IMTMC/S (ATMSi) development. Exhibit 7 below indicates the subgroup structure and/or the associated regional projects that form each subgroup. Some of the subgroup projects are also Showcase Program projects as indicated.

Exhibit 7 – IMTMS Subgroups & Associated San Diego Regional Projects

Subgroup type	Associated Project or Group	Subgroup Agency	Showcase Program Project?
Freeway Management	<ul style="list-style-type: none">Advanced Transportation Management System (ATMS) and Advanced Transportation Management System – Intermodal (ATMSi) through the IMTMC/S project(s).	SANDAG, Caltrans District 11	Yes
Transit Management	<ul style="list-style-type: none">Regional Transit Management System (RTMS) Project	SANDAG	No
	<ul style="list-style-type: none">Regional Advanced Vehicle Location (RAVL) Project, Transit Demonstration	SANDAG	Yes

Subgroup type	Associated Project or Group	Subgroup Agency	Showcase Program Project?
Arterial Management	Regional Traffic Signal Integration Project consisting of the following Regional Arterial Management System (RAMS) projects:	SANDAG	Yes
	<ul style="list-style-type: none"> RAMS Tier 1 RAMS Tier 2 	SANDAG	No
CVO/Borders	Commercial Vehicle and International Border Freight Advisory Committee (inactive)	SANDAG	Yes
Traveler Information Management	San Diego Advanced Traveler Information System Project	SANDAG	No
Incident/Event Management	Incident & Event Management Subgroup	CHP Border Division, Caltrans District 11	No
Communications/IMTMS Network	Communications Subgroup	Caltrans District 11	No

2.3 ATMSi Component Overview

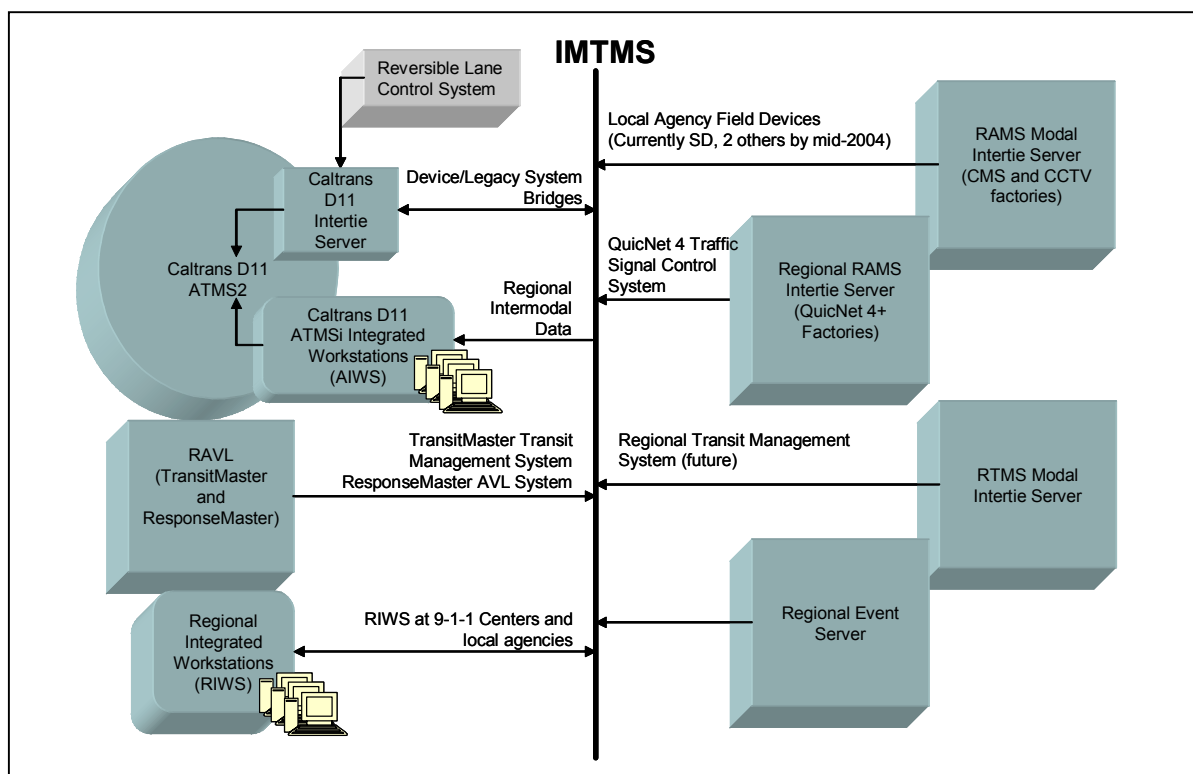
The operating system used at the Caltrans and CHP transportation management centers (TMCs) is known as the Advanced Transportation Management System (ATMS). A version of the ATMS application was designed, developed, and deployed for Caltrans District 7 (Los Angeles) and is currently in its second version. ATMS Version 2 (ATMS2) was chosen for subsequent deployment at San Diego's regional Caltrans District 11/CHP TMC under the IMTMC/S project. A module of ATMS2 is the Intermodal Advanced Transportation Management System (ATMSi). The ATMSi is integrated with other IMTMS hardware and software, and facilitates the exchange of regional intermodal data with participating stakeholders and supporting infrastructure. Project partners recognized early on that ATMS2 would need to be developed to support Y2K compliance requirements and provide a basis for ATMSi.

The primary objective of the ATMSi is to enhance the baseline ATMS2 to support intermodal operations in the San Diego region. The core element of the ATMSi is the implementation of an intertie capability between Caltrans District 11 and local agencies within the San Diego region. Intertie functions include sharing of information, status and – based on inter-agency agreements – control of selected field elements. The ATMSi has been the focus of the IMTMC/S evaluation activities and is the subject of this evaluation report.

2.3.1 ATMSi Architecture

The ATMSi interfaces with the San Diego regional IMTMS network through the ATMSi Intertie Server (AIS) and through the development of associated legacy bridges, object factories and web services. The IMTMC/S architecture, through build 3 of the ATMS, was initially designed to be consistent with the Showcase Architecture. The original Showcase Architecture was comprised of four regional Kernels that were connected by the Showcase Network. The current Showcase Architecture has evolved to four regional Caltrans Intertie Servers that will be connected by the successor to the Showcase Network. The IMTMS network architecture now distributes the original Kernel services across the regional network on the Caltrans District 11 Intertie Server and Modal Intertie Servers. The Southern California Priority Corridor Technical Advisory Committee (formerly the Technical Management Subcommittee) has been the reviewer of all documents related to this project to ensure compliance with the original Showcase Architecture. Exhibit 8 depicts a simplified overview of the IMTMS architecture and the ATMSi Integrated Workstation (AIWS).

Exhibit 8 – Simplified IMTMS Architecture Overview



Additionally, Phase 1 of the IMTMS project has developed user requirements for the San Diego Transit Management System (RTMS) Project and the Regional Traffic Signal Integration Project (also known as the Regional Arterial Management System or “RAMS” project).

2.3.2 ATMSi System Configuration Summary

The ATMSi system is comprised of the AIWS and AIS. The AIWS interfaces with the San Diego regional IMTMS network through the AIS and through legacy bridges, object factories, and web services. ATMSi web services will produce and accept standard transportation objects in eXtensible Markup Language (XML) format based on existing US DOT standards. ATMSi conforms to the regional Center object architecture for service discovery and naming. Common services that were formerly part of the Showcase Kernel architecture have been integrated into the ATMSi Intertie Server and the Center Object Architecture. A description of each of the system components follows.

System Component	Component Description and Function
<i>ATMSi Intertie Server (AIS)</i>	Currently, HP Unix server. As part of the ATMSi development effort, the server will be converted to a PC based platform running Windows 2003 Server applications.
<i>ATMSi Integrated Workstation (AIWS)</i>	The ATMSi integrated workstation is currently located at Caltrans/CHP TMC. The primary function of the workstation is to provide a platform for the ATMSi GUI and allow users various intermodal and multimodal transportation data. As part of the ATMSi development effort, the project will be funding the conversion of the ATMS operator workstations from the current HP-UX platform to a PC based platform and include the conversion of the associated Commercial Off The Shelf (COTS) packages.

2.3.3 ATMSi Logical Architecture

The first release of ATMSi was called Release 3 and was implemented in conjunction with the Mission Valley Event Management (MVEM) project. Release 3 added an Intertie Server, the ATMSi Intertie Server (AIS) to the existing ATMS2 network at the Caltrans District 11 TMC. Release 3 also provided an ATMSi Integrated Workstation (AIWS). (A more detailed description of the ATMSi system releases and development approach can be found in *Section 3 System Performance Evaluation*.)

The AIS extracts selected data from the ATMS2 network and provides this data to the AIWS and the Regional Integrated Workstations (RIWS). Agencies around the San Diego region that have an RIWS and an agreement with Caltrans can view and/or control Caltrans field devices and other resources. VDS field data is processed as designed for ATMS2. VDS point data and linear congestion data is available to the regional IMTMS network. Vent management and automatic incident detection will also remain as currently designed for ATMS2. ATMSi Release 3 will use Caltrans District 3 CCTV switch protocols that are converted to IP routing commands by

equipment within the TOSNET. CCTV and CMS field device control resides in ATMS2 manager processes that are converted to factory objects which in turn allows external control of these devices. ATMSi also implements required security and naming services to assist in managing the external control of CMS and CCTV devices.

2.3.4 ATMSi Communications Design

ATMSi hardware resides on a common network with Caltrans District 11 hardware currently supporting ATMS2 and the San Diego Ramp Metering Information System (SDRMIS). Additionally, the system developer's site is connected to the network by a leased DSL line. During the various phases of the ATMSi development, communications are being transitioned from the leased lines used to control the CMS, VDS and RMIS devices to District 11's Gigabit Ethernet/IP-based TOSNET. The ATMSi sub-network supports internal communications between the ATMS2 database server, the applications server, and the ATMSi Intertie server as well as up to ten operator workstations for Caltrans and CHP operations personnel. Routers and protective firewalls connect the ATMSi sub-network to the regional IMTMS network.

3 System Performance Evaluation

3.1 *The Project/System Development Process and Timeline*

The deployment of the ATMSi project has experienced numerous delays that have prevented the system from reaching full deployment during the period of the evaluation. As part of the system performance evaluation, the project and system development process, history, and development timeline are examined.

Although the project has completed development tasks through the first release of ATMSi (known as release 3 for reasons explained in the following sub-sections), important lessons have been learned from these tasks and are discussed in this section for the benefit of similar future development efforts. Therefore, this section contains information and lessons learned relative only to system planning, design, project schedule, and the mutual influence of Showcase Program integration and this project on regional transportation planning and future systems.

3.1.1 Overview of IMTMC/S Project Phasing

The development of the ATMSi and its parent project, IMTMC/S, has included much more than the simple deployment of a single system broadly deployed to multiple users or agencies. Phases of the IMTMC/S project have incorporated tasks to support the development of an interconnected network of transportation management systems from various modes, various field devices, and standardized computer servers and workstations. The servers and workstations provide users with information, data, and control of the San Diego region transportation management systems, devices, and activities.

The IMTMC/S project was originally conceived and included as part of the San Diego Regional Intelligent Transportation Strategic Plan of 1996. Project kick-off took place in 1998. The project has been 8 years in planning and development as of the writing of this document.

The project has been organized in two phases. Phase 1 includes primarily planning, design, procurement, and related project support tasks. Phase 2 includes more focused ATMS and ATMSi design, development and upgrades, IMTMS network design and upgrades, and continued related San Diego region project support. More specifically, Phase 1 includes the following activities:

- Requirements Engineering - Freeway Management Systems (ATMS2, ATMSi), Arterial Management Systems (RAMS), Transit Management Systems (RAVL, RTMS), and Traveler Information Management Systems (ATIS, ATIMS, CVO).
- Deployment Support for Interrelated Projects – RAMS Procurement / Systems Engineering, TrMS Procurement / System Engineering, and the ATIS Business Framework.
- ATIS Procurement / Systems Engineering.
- ATMS2 Port from D7, Release 1 (this was the only non-design task included in Phase 1).

Phase 2 of the project is comprised of Work Orders 4, 5, and 6, which include a variety of tasks that continue the design and deployment of ATMS2, ATMSi, the IMTMS network, and support for interrelated projects. Work Order 4 includes the following completed activities:

- ATMS2 Port from Caltrans District 7, Release 2
- ATMSi Release 3 (this is the first build of the ATMSi component of ATMS2)

Phase 2 Work Order 4 also includes the following on-going activities:

- Systems Design for RAMS, RAVL and ATIS
- IMTMS Network Design
- IMTMS Operations & Maintenance

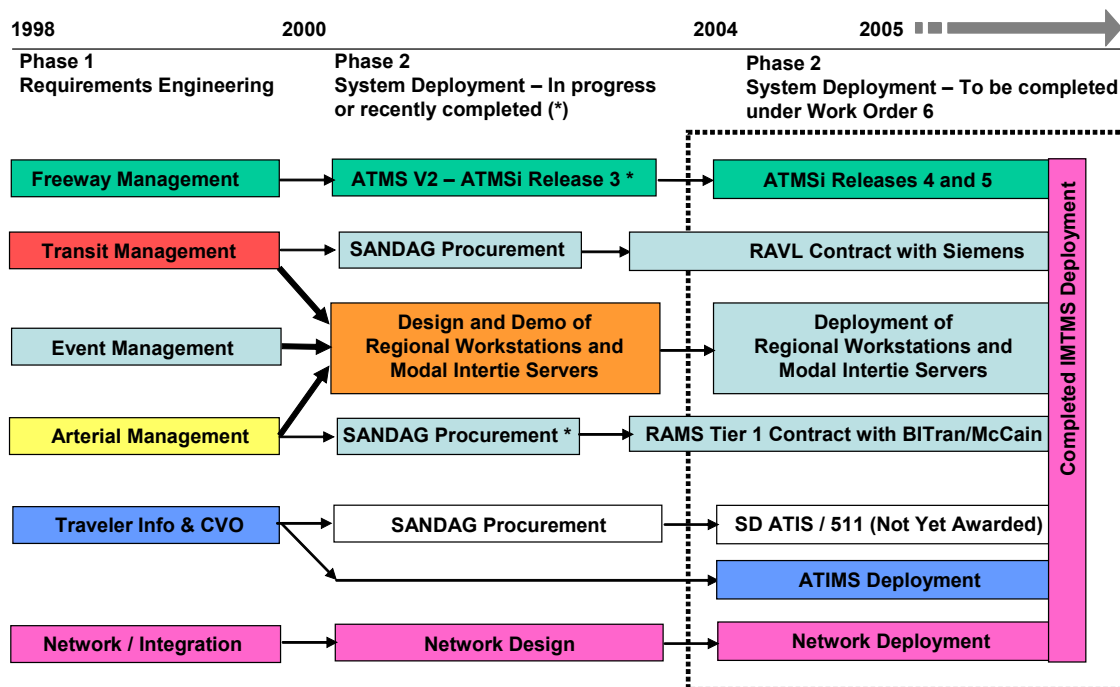
Phase 2 Work Order 5 was simply an extension of time on the contract.

Phase 2 Work Order 6 has not been approved by SANDAG as of the completion of this document. Work Order 6 has been pending approval since June 2003. Work Order 6 will include the following activities:

- Completes the ATMSi Project (Releases 4 and 5), the ATMS Integrated Workstation, and provides updates to ATMS2.
- Completes various regional project functions including:
 - Regional Integrated Workstation updates to the user display and data entry functions,
 - Modal Intertie Servers for RAMS and RAVL to provide capability to collect and reformat agency data,
 - ATIMS Server which will provide an ATIS gateway to SANDAG 511 services, and,
 - Regional IMTMS Network capability upgrades to include inter-agency Communications.

The figure in Exhibit 9 provides a high level overview of the IMTMC/S project phases including the ATMSi component shown across the top of the chart beneath the phase timeline.

Exhibit 9 – Overview of IMTMC/S Project Phases



3.1.2 ATMSi Component Phasing

ATMSi is simply a version of ATMS2 that provides intermodal data and information along with field device data and control to form a more complete picture of the transportation system in the San Diego region. ATMSi integrates this data on to a PC-based workstation.

Operationally, ATMSi is being developed in what the system developer calls *releases*. These releases represent development phases of ATMSi and the release numbers coincide with the versions of ATMS2, the system that ATMSi is based upon. Throughout project documentation, references will be made to a release number associated with ATMSi. These release numbers actually refer to releases of the ATMS2 system and software. Therefore the first release of ATMSi, which is the third release of the ATMS2 system and software, would be referred to as ATMSi Release 3. ATMSi releases are summarized in the table in Exhibit 10.

Exhibit 10 – ATMSi Development Phases (Releases of ATMS2)

ATMSi Release	Related ATMS2 Release	Commonly known in project documentation as...	Summary of Release Capabilities
ATMSi First Release (Completed)	ATMS2 Release 3	ATMSi Release 3	<ul style="list-style-type: none"> Completed under Work Order 4 Sharing event, congestion, CCTV and CMS data/control with external agencies (e.g. City of SD)
ATMSi Second Release	ATMS2 Release 4	ATMSi Release 4	<ul style="list-style-type: none"> To be developed under Work Order 6 New workstations, some map upgrades Integration of transit data
ATMSi Third Release	ATMS2 Release 5	ATMSi Release 5	<ul style="list-style-type: none"> To be developed under Work Order 6 Integration of FSP/TMT AVL Integration of QuicNet 4+ data Additional map upgrades

The original contract tasks have changed periodically to accommodate changes in schedule and scope. The movement of original contract task funding to new tasking has been tracked by Caltrans District 11 staff. These changes, known as forbearance, are simply movement of dollars within the contract from one task to another more appropriate or more urgent task without changing the dollar amounts or scope of the project. The following table in Exhibit 11 is a summary of ATMSi tasks contracted under IMTMC/S Contract Phase 2 - Work Order 4. Under the Task column, the contract task numbers are shown. In the Description, a number/letter combination preceding the task/deliverable name indicates the deliverable number used to track the deliverables contractually. Currently, this project has produced over 245 deliverables. The status column indicates task status as of the completion of this document.

Exhibit 11 – ATMSi Tasks contracted under Work Order 4

Task	Description	Status
Task 7.0	ATMSi Development	
Task 7.1	40A) Draft ATMSi Software Design Description - Build 1	Complete
	40B) Final ATMSi Software Design Description - Build 1	In-progress
	40C) Draft ATMSi Software Design Description - Build 2	In-progress
	40D) Final ATMSi Software Design Description - Build 2	In-progress
	40E) Draft ATMSi SDD - Build 3 (future Amend)	Future
	40F) Final ATMSi SDD - Build 3 (future Amend)	Future
Task 7.2	41) Procurement List for ATMSi Builds 1-3	In-progress
	42) Configuration Plan for ATMSi Builds 1-3	In-progress
Task 7.3	43A) Build Review Presentation ATMSi Build 1	Complete
	43B) Build Review Presentation ATMSi Build 2 (future Amend)	Future
	43C) Build Review Presentation ATMSi Build 3 (future Amend)	Future
Task 7.4	44) TM: Hardware Performance Report ATMSi Builds 1-3	In-progress
Task 7.5	45A) ATMSi Build 1 Distribution 1 to D11	Complete
	45B) ATMSi Build 1 Distribution 2 to D11	Complete

Task 7.6	46A) Draft Acceptance Test Plan (future Amend)	Future
	46B) Final Acceptance Test Plan (future Amend))	Future
	47A) Draft Acceptance Test Procedures (future Amend)	Future
	47B) Final Acceptance Test Procedures (future Amend)	Future
	48) Test Readiness Review (Milestone) (future Amend)	Future
	49) Completed Acceptance Test (future Amend)	Future
	50) Acceptance Test Report (future Amend)	Future
Task 7.7	51) ATMS2.CTD11.1 Source Code	Future
	52-69) Spares	Future
Task 8	ATMS2/ATMSi Support	
Task 8.1	70) ATMS2 Operations Training	Complete
	71) ATMS2 Operator's Manual	Complete
	72) ATMS2 Operator Training Materials	Complete
	73) ATMS2 Traffic Engineering Training	Complete
	74) ATMS2 Traffic Engineering Manual	Complete
	75) ATMS2 Sys Admin Training	Complete
	76) ATMS2 Maintenance Manual	Complete
	77) ATMS2 Database Manual	Complete
	78) ATMS2 Diagnostics & Troubleshooting Manual	Complete
	79A) ATMS2 SW Design Description - Prototype Draft Becomes: 175) RIWS Release 1.1 Deployment	Forbearance/ Complete
	79B) ATMS2 SW Design Description - Prototype Final Becomes: Unnumbered Task) Move SDE (System Development Environment) to District 11 Development Server	Forbearance/ Complete
	79C) ATMS2 SW Design Description - Final Draft Becomes: Unnumbered Task) Upgrade COTS Software for ATMS Release 1 and Release 2	Forbearance/ Complete
	79D) ATMS2 SW Design Description - Final (All processes) Becomes: 3, 26) IMTMS Project Web site and ATMS2 CCTV Upgrades	Forbearance/ Complete
	80A) ATMS2 Configuration Database Update #1	In-progress
	80B) ATMS2 Configuration Database Update #2	In-progress
	81A) ATMS2 SPR Support #1	Complete
	81B) ATMS2 SPR Support #2	Complete
	81C) ATMS2 SPR Support #3	Complete
	81D) ATMS2 SPR Support #4	Complete
	82A) ATMS2 Telephone Support #1	In-progress
	82B) ATMS2 Telephone Support #2	In-progress
	82C) ATMS2 Telephone Support #3	In-progress
	82D) ATMS2 Telephone Support #4	In-progress
	83A) ATMS2 On-Site Support #1	Complete
	83B) ATMS2 On-Site Support #2	Complete
	83C) ATMS2 On-Site Support #3	Complete
	83D) ATMS2 On-Site Support #4	Complete
Task 8.2	90-102) TBD	Future
	103-119) Spares	Future

Task 9	Regional IMTMS System Manager Support	
Task 9.1.1	120A) ATMSi Project Management #1	Complete
	120B) ATMSi Project Management #2	Complete
	120C) ATMSi Project Management #3	Complete
	120D) ATMSi Project Management #4	Complete
	120E) ATMSi Project Management #5	Complete
	120F) ATMSi Project Management #6	Complete
	120G) ATMSi Project Management #7	Complete
	120H) ATMSi Project Management #8	Complete
	120I) ATMSi Project Management #9	Complete
	120J) ATMSi Project Management #10	Complete
	120K) ATMSi Project Management #11	In-progress
	120L) ATMSi Project Management #12	In-progress
	120M) ATMSi Project Management #13	In-progress
	120N) ATMSi Project Management #14	In-progress
	120O) ATMSi Project Management #15	In-progress
	120P) ATMSi Project Management #16	In-progress
Task 10	IMTMS Network Support	
Task 10.1	159) ATMSi Intertie Server - Kernel Integration V1.0	In-progress

Future tasking under Work Order 6 of the IMTMC/S contract will include completion of ATMSi. Release 4 and 5 will be developed under Task 7 and operations and maintenance tasks will occur under Task 8. Exhibit 12 is an overview of all Work Order 6 Tasks.

Exhibit 12 – Overview of All Work Order 6 Tasks

Task	Description
Task 0	Project Management
Task 6	ATMS2 Upgrades
Task 7	ATMSi Release 4 and 5
Task 8	ATMS2 / ATMSi Operation and Maintenance
Task 9	IMTMS Systems Engineering
Task 10	IMTMS Deployment
Task 11	Regional Communications
Task 12	ATIS / 511 Deployment
Task 13	COTS Hardware and Software Procurements

Work Order 6, Tasks 7 and 8, are focused on the development, deployment, operations and maintenance of ATMSi Releases 4 and 5. The table in Exhibit 13 provides a detailed description of tasks associated with the completion of ATMSi planned under IMTMC/S Contract Phase 2 - Work Order 6.

Exhibit 13 – ATMSi Tasks Planned for Work Order 6

Task	Description	Status
Task 7	ATMSi Design, Development and Test	Future
Task 7.1	ATMSi Software Design Document	Future
	<i>Milestone: ICD for QN4+ Available</i>	Future
	40E Draft ATMSi SDD - Release 5	Future
	40F) Final ATMSi SDD - Release 5	Future
	40G) ATMSi R5 CDR	Future
Task 7.3	Release Reviews	Future
	43B) Release Review ATMSi R4	Future
	43C) Release Review ATMSi R5	Future
Task 7.5	ATMSi Software Development	Future
	45C) ATMSi Release 4.1 Distribution 1 to D11	Future
	45D) ATMSi Release 4.1 Distribution 2 to D11	Future
	<i>ATMSi R 4.1 Complete</i>	Future
	45E) ATMSi Release 4.2 Distribution 1 to D11	Future
	45F) ATMSi Release 4.2 Distribution 2 to D11	Future
	<i>Milestone: ATMSi R 4.2 Complete</i>	Future
	137) Regional Event Management Workshop	Future
	45G) Install, Populate, Document CM (cc:Harvest or equiv.)	Future
	45H) ATMSi Release 5 Distribution 1 to D11	Future
	45I) ATMSi Release 5 Distribution 2 to D11	Future
	<i>Milestone: ATMSi R 5.0 Complete</i>	Future
	<i>Milestone: IMTMS Development Complete</i>	Future
Task 7.6	IMTMS Acceptance Test	Future
	46A) Draft IMTMS Acceptance Test Plan	Future
	46B) Final IMTMS Acceptance Test Plan	Future
	47A) Draft AT Proc R4.2	Future
	47B) Final AT Proc R4.2	Future
	203B) Release 2.2 for MIS/RIWS	Future
	273) ATIMS SW Release 1	Future
	48) TRR R4.2 (Milestone)	Future
	49) Completed Acceptance Test R4.2	Future
	50) Acceptance Test Report R4.2	Future
	279) ATIMS Source Code	Future
	51A) Draft AT Proc R5	Future
	51B) Final AT Proc R5	Future
	210B) Release 3.2 for MIS/RIWS	Future
	52) TRR R5 (Milestone)	Future
	53) Completed Acceptance Test R5	Future
	54) Acceptance Test Report R5	Future
	<i>Milestone: Release 3 of MIS/RIWS Complete</i>	Future
	<i>Milestone: Release 2 of MIS/RIWS Complete</i>	Future
Task 7.7	ATMSi Source Code Delivery	Future
	55) ATMS2.CTD11.5 Source Code	Future
Task 8	ATMS2/ATMSi Support	Future
Task 8.1	ATMS2 Documentation Updates	Future
	70A) ATMS2 Operator's Manual (update)	Future
	71A) ATMS2 Operations Training Materials (update)	Future
	72A) ATMS2 Operations Training (update)	Future
Task 8.2	ATMS2 Configuration Database Update	Future
	80C) ATMS2 Configuration Database Updates 3	Future

Task	Description	Status
Task 8.3	ATMS2/ATMSi CM/SPR Support	Future
	81E) ATMS2/I SPR Support #5	Future
Task 8.4	ATMS2/ATMSi Telephone Support	Future
	82E) ATMS2/I Telephone Support #5	Future
Task 8.5	ATMS2/ATMSi On-Site Support	Future
	83E) ATMS2/I On-Site Support #5	Future
Task 8.6	ATMSi Training and Documentation	Future
	90) ATMSi R4 Operator's Manual	Future
	91) ATMSi R4 Ops Training Materials	Future
	92) ATMSi R4 Operator Training	Future
	93) ATMSi R5 Operator's Manual	Future
	94) ATMSi R5 Ops Training Materials	Future
	95) ATMSi R5 Operator Training	Future
	96) ATMSi Maintenance Manual	Future
	97) ATMSi Database Manual	Future
	98) ATMSi Diagnostic & Troubleshooting Manual	Future
	99) ATMSi System Admin Training	Future

3.1.3 ATMSi Pilot Testing and Acceptance Testing

Pilot testing and acceptance testing for ATMSi Release 3 have not been performed by the project partners under the recently completed ATMSi development tasks. Acceptance testing is scheduled to be performed upon the completion of ATMSi Releases 4 and 5.

The ATMSi Release 3 GUI and application are currently up and running on a development workstation in the computer room of the San Diego Caltrans/CHP TMC. This workstation demonstrates the functionality of ATMSi as designed for Release 3, but is not currently used in daily operations.

3.2 *Impact of Showcase Integration on Project Deployment and System Performance*

3.2.1 Impact of ATMSi on other Showcase Projects

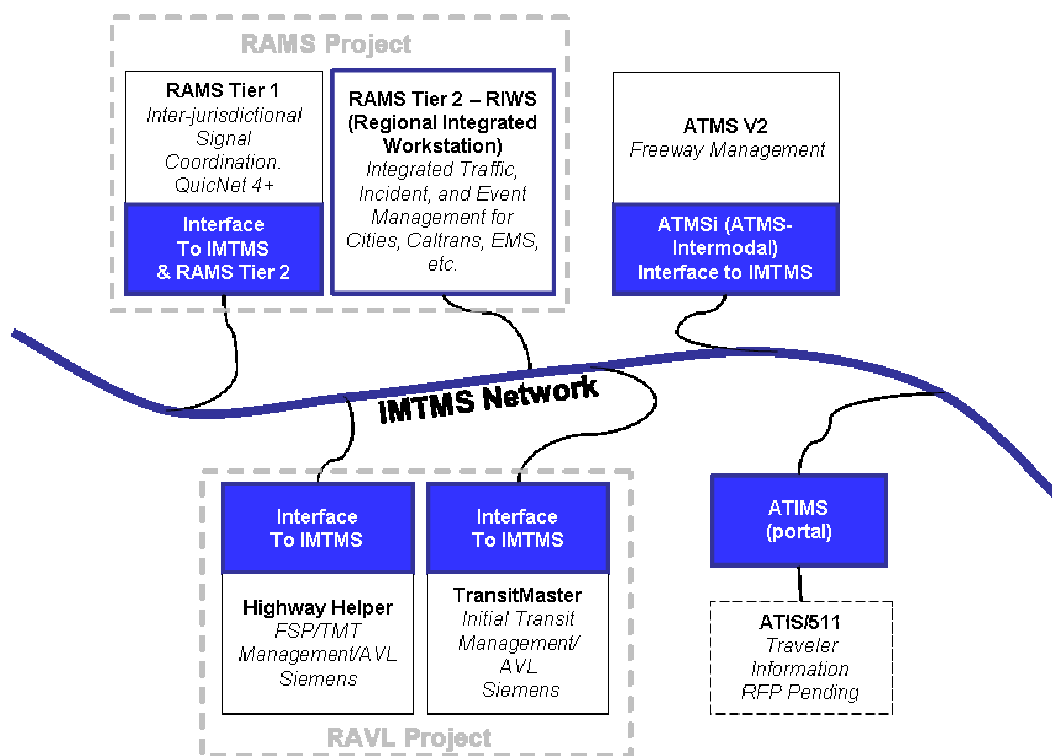
The ATMSi and IMTMC/S projects have provided essential, pivotal support to other regional Showcase projects through common design, engineering, and integration assistance for the IMTMS network.

Overall, the ATMSi and IMTMC/S projects have provided innumerable benefits to the deployment of other San Diego regional projects in terms of coordinated planning, design and development. The IMTMC/S pulls a common thread through each of the regional projects that will use data or information from other modal systems through the IMTMC/S network. These projects have been pivotal in

- The IMTMC/S project and funding enables the continuation of the development of the regional IMTMS network, the RIWS, and the integration of the regions transportation management systems. It is only through this common project that regional projects have stayed on a common development track to enable their systems to share data and functionality.
- As with other predecessor Showcase-funded projects in the San Diego region, IMTMC/S, ATMSi and the regional IMTMS network continue to be a microcosm of the common regional network and the “Design Once, Deploy Many Times” concept originally envisioned for the Southern California Priority Corridor transportation systems.
- The ATMSi provides the interface to the IMTMS network for the ATMS. The ATMS Intertie servers and integrated workstations are the Caltrans connections to the intermodal systems and data through out the region and will provide the basis on which all other regional workstations and servers will be configured, operated, and maintained.

Exhibit 14 depicts the commonality of the IMTMS network to various other regional projects and shows in the shaded or heavy lined boxes where the IMTMC/S and ATMSi projects have provided support in design and development for connection to the regional network.

Exhibit 14 – IMTMS Network and Modal Connections



3.2.2 Impact of other Showcase Projects on ATMSi

The intricacy of the relationships with other regional and inter-regional Showcase projects has introduced complex dependencies that have caused periodic delays to the development of the ATMSi and IMTMS network.

Because the IMTMC/S project is responsible for coordinating the development of the ATMS, the regional IMTMS network, the interfaces for the various regional project systems to the IMTMS network, ATMS, and ATMSi, the introduction of external dependencies has been inescapable. Many of the dependencies have changed or evolved though out the life of the project and the rippling of these dependencies through the other projects has been cause for constant vigilance on the part of the project management and system developers. A delay in any key aspect of the Showcase program, such as delays introduced by technology changes (due to obsolescence or compatibility issues), or delays due to funding or contractual issues, have continually impacted the progress and complexity of this project.

An additional impact to the project has been the large number of deliverables associated with the cross-project engineering and development associated integration to the IMTMC/S network. This has created a need for intricate tracking of project funding sources, deliverables, and budgets by the project management. Currently, Caltrans staff are carefully recording and monitoring this information.

4 Cost Evaluation

The cost evaluation draws information from documented costs and personal interviews. This cost evaluation is based on project budget information for the IMTMC/S and ATMSi projects to date. Costs were derived directly from the project contracts, amendments, accounting of deliverables (from the project management), and deliverable documents. Informal interviews were conducted to verify and supplement information as needed during analysis. The ATMSi did not reach full deployment during the period of this evaluation; therefore, the cost analysis that follows in this section is focused on the costs of development to date for the ATMSi. Additionally, this section includes a summary of funding sources and planned costs for the completion of ATMSi.

4.1 *Constraints & Assumptions*

This cost evaluation is based on costs as reported by the project manager, contract manager, or system developer. The contract costs indicate the current value of the contract including any amendments.

The allocation of funding to the large number of contract tasks and deliverables associated with the IMTMC/S project is intricate and complex. The project management and project partners provided information to the evaluator such that project task budgets could be estimated for IMTMC/S tasks in general. ATMSi specific components are often combined into tasks with other components of IMTMC/S deployment. The evaluator has delineated ATMSi specific tasks wherever possible.

4.2 *Project Budget & Estimated Development Costs*

4.2.1 Project Budget

The IMTMC/S project is being conducted under a task order contract for \$8,402,209 and was funded by a variety of grants derived from federal, state, and local sources.

The IMTMC/S Project was funded through the Priority Corridor Showcase Program under the Intermodal Transportation Management Center, Transportation Management System Grants, Signal Integration, and Traveler Information System grants. Additional funding was provided through the ITS Planning Cooperative Agreement. Grants or Funds, their sources, amounts and allocations to the IMTMS contract are detailed in Exhibit 15.

Exhibit 15 – Funding Sources for the IMTMC/S Project and ATMSi Component

Grant or Fund	Fund Sources	Fund Amount	IMTMC/S Contract Allocation
Intermodal Transportation Management Center (IMTMC) Grant	SCPC Showcase Program	\$1,460,000	\$1,460,000
	Caltrans Research & Innovation	\$19,842	\$19,842
Transportation Management System Grant	CMAQ	\$5,334,000	\$5,334,000
	TransNet	\$148,000	\$148,000
	STIP-RIP	\$680,000	\$680,000
Signal Integration Grant	CMAQ	\$250,000	\$416,887
	SANDAG (FSP)	\$257,000	
	SCPC Showcase Program	\$1,100,000	
	Caltrans Research & Innovation	\$18,000	
Regional Traveler Information System Grant	CMAQ	\$3,541,000	\$350,000
	TransNet	\$1,063,000	
	STIP-RIP	\$460,000	
ITS Planning Cooperative Agreement	ITS Planning Project	\$165,893	\$165,893
	ITS Outreach Project	\$73,449	\$73,449
Total Programmed Funds			\$8,402,209

The IMTMC/S contract currently consists of a base contract, three amendments, and two subsequent work orders, with one of those work orders still pending approval. Ceiling amounts for each of the contract amendments or work orders is shown in Exhibit 16.

Exhibit 16 –Budgets of the IMTMC/S Contract(s) to Date

Contract, Amendment or Work Order	Contractor	Contract Current Ceiling Values	Percentage
IMTMC/S Base Contract	NET	\$908,066.11	8.16%
Base Contract Amendment 1	NET	\$950,491.03	8.55%
Base Contract Amendment 2	NET	\$1,165,192.55	10.48%
Base Contract Amendment 3	NET	\$1,757,498.07	15.80%
Work Order 4	NET	\$2,873,957.82	25.84%
Work Order 5 (Extension of time)	NET	No Cost	0%
	Sub Total	\$7,655,205.58	
Work Order 6 *	NET	\$3,467,299.99	31.17%
	Total	\$11,122,505.57	100%

* Work Order 6 not yet approved by SANDAG

Work Order 4 and Work Order 6 tasks specifically related to the design, development and deployment of ATMSi are shown in Exhibit 17.

Exhibit 17 –Budgets of the ATMSi Specific Tasks

Contract, Amendment or Work Order	Total Work Order Value	Value of ATMSi Tasks	ATMSi Percentage of Total Work Order
Work Order 4	\$2,873,957.82	\$1,397,040.36	48.61%
Work Order 6 *	\$3,467,299.99	\$2,605,396.72	75.14%

* Not yet approved by SANDAG

Funding sources for Task Order 6 have not yet been identified or were not available for release to the evaluation team.

4.2.2 Design Once, Deploy Many Times

The IMTMC/S ATMSi project provides the standardized common interface that will be the backbone for other regional projects, thus demonstrating another critical aspect of the SCPC Showcase concept of “Design Once, Deploy Many Times.”

An important aspect of the IMTMC/S project is its vital role in the design, development, and deployment of the regional IMTMS network, the standardized RIWS, and the ATMSi. This project will be the third project in the San Diego area to deploy the servers and workstations that are planned for use throughout the region as part of the regional network.

Additionally, and very importantly, the IMTMC/S project includes tasks that assist other regional projects in developing the appropriate software or procuring the appropriate hardware to ensure that their systems will integrate seamlessly with the regional network and interact in a standardized way with other systems sharing data on the network. Without the integrated design, engineering, and planning that has occurred throughout the duration of this project, the ATMSi would not be possible. The ATMSi is the culmination of the tasks to integrate the various transportation information systems throughout the San Diego region.

5 Institutional Impacts Evaluation

5.1 *Impacts to Operations and Maintenance Policies and Procedures*

The ATMSi project has developed San Diego's first regional intermodal advanced transportation management system through continuing open dialogue and project partner consensus.

The concept for the IMTMC project was developed cooperatively by the participating local agencies through the regional ITS Strategic Planning Committee. The group developed the vision and the basic requirements for the system prior to the release of the request for proposals in 1997. The vision focused the project on the development of a common regional network on which all transportation systems in the region could share data and distribute information to make freeways, arterials, transit, and other modal systems work together efficiently. Since then, the project has evolved into a set of projects and sub-components each serving a segment of the transportation modes and communities in the San Diego region.

The primary accomplishment of the project partners in this arena has been their leadership in maintaining common goals, standards for the region's transportation management systems. Additionally, project partners have worked consistently to resolve issues and achieve consensus on most regional transportation issues. This consensus has been achieved through the persistent dialogue between project partners, regional leaders, and stakeholders, resulting in the development of policies and procedures that benefit the entire region rather than a single entity therein.

5.2 *Impacts to Staffing/Skill Levels and Training*

Project coordination across the San Diego region provided by IMTMC/S project has added considerable and unquantifiable value to all area transportation projects.

An important contribution of high value, which cannot be easily assessed in terms of its cost, is the participation of the many local agencies, their staff, and representatives of other modal groups in the IMTMC/S project planning and deployment.

Through the regional ITS Strategic Planning Committee meetings, project participants and related project partners have invested significant amounts of time in the development of the regional vision for the IMTMS network and the integrated transportation systems that use it. The monthly committee meetings, and individual sub-group working meetings, provided a regular forum for coordination between regional planners, system developers, project managers, public and private agencies, and effectively kept all participants up-to-date and moving in the same direction. These meetings offered a venue for sharing valuable lessons learned, solving common problems, resolving policy or planning concerns, and pulling together experts and interested parties to collaborate on issues that would otherwise not benefit from their collective knowledge. The committee meetings have been indefinitely discontinued.

Public sector project participants indicate that the coordinated meetings were beneficial for the reasons stated above, but were faced with difficulty allocating time to attend meetings due to resource constraints and lack of staff to assist with all of their regional responsibilities. Project participants indicate that the reinstitution of a similar regularly scheduled regional coordination and update meeting would be instrumental in maintaining the momentum, coordination, and essential communication between the various project partners.

5.3 Impacts to the Competitive Environment

The impact to the competitive environment in San Diego with respect to the IMTMC/S project will be uncertain until the systems are fully deployed. Documentation and standards that can be easily accessed and applied by future system developers will assist in maintaining healthy competition in the region.

The development of the IMTMC/S systems and networks has been contracted to a single firm, National Engineering Technology (NET) Corporation, and their various subcontractors. The contracting of this project to NET has benefited the region in that it has coordinated the design and engineering across multiple projects and kept projects in step, on same page, technically and institutionally. Communication between various regional project managers has been centralized and flows neatly through the managing system developer. The impacts to the competitive environment are not yet apparent.

The health of the competitive environment can be preserved only through the complete and thorough documentation of all work performed by the current system developer. The willingness of the system developer to use common, non-proprietary hardware and software and develop products based on open standards will impact the ability of future vendors to contribute to operation, maintenance, upgrade and enhancement of this foundation system.

5.4 Impacts to Local Planning Processes, Policy Development, and the Mainstreaming of ITS

The IMTMC/S, ATMSi and regional ITS have benefited from regional collaboration in project planning and implementation, and have been challenged by changes in local agency responsibilities.

The IMTMC/S project is by nature inter-agency and inter-jurisdictional; thus, the planning and policy development processes surrounding design, deployment, and operation of the system have taken on a uniquely collaborative approach. The local planning process has benefited from a common network project that maintains the necessity for the various agencies responsible for crafting the region's vision for ITS to sustain working relationships and regular communication.

During 2003, legislation in California placed more responsibility on the shoulders of metropolitan planning organizations (MPOs). In response, San Diego's primary MPO,

SANDAG, has transitioned into project management and system deployment. SANDAG has reorganized and repositioned itself with appropriate staff and facilities to meet and handle its increased responsibilities and expanded leadership position. This transition has had an impact on the progress of all Showcase projects in the region, but it is expected to provide more focused planning, management, and deployment of San Diego's transportation projects.

6 Traveler and Transportation Information Management Evaluation

The IMTMC/S project continues the regional vision of intermodal and inter-agency management of traffic and transportation systems, field devices, and infrastructure through the deployment of ATMSi and the IMTMS network. The ATMSi was not fully deployed as of the completion of this report; therefore, an evaluation of traveler and transportation information management was not possible during the period of the evaluation. However, there are significant lessons learned from the coordinated, multi-agency planning and design efforts. Sections 1-4 of this document describe some of the lessons learned and discuss findings based on anecdotal evidence collected through interviews with project partners.

Some additional future benefits of ATMSi that are expected by the project partners include:

- The ability to monitor and manage transportation systems, field devices, and communications during regional events, incidents and emergencies;
- Improvements in the coordination between agencies responsible for the management of the freeways, arterials and transit systems;
- Delivery of information regarding different transportation modes to travelers;
- Deployment of regional transportation management systems to agencies at the local level.

7 Transportation System Impacts Evaluation

An evaluation of IMTMC/S-ATMSi transportation system impacts was not possible during the period of the evaluation; however, there are significant lessons learned from the coordinated, multi-agency planning and design efforts. Sections 1-4 of this document describe some of the lessons learned and discuss findings based on anecdotal evidence collected through interviews with project partners.

Some additional future system impacts of IMTMC/S-ATMSi expected by the project partners include:

- Improvement in freeway and arterial mobility through signal coordination, shared control field devices and coordinated regional event management;
- Improvements in timeliness, accuracy, and completeness of traffic/travel information to the traveling public (freeway, arterial, transit);
- Improvements in special event management by extending systems to multiple agencies and multiple venues in the region;
- Decrease in operations and maintenance costs by transitioning to PC-based workstations and local agency servers

Conclusions and Recommendations

The IMTMC/S-ATMSi project is expected to enhance and promote the concept of a common system for sharing, display, and control of transportation system field devices in the San Diego region. Project partners are positive about the potential benefits of the regional IMTMS network and the distribution of the regional system to local agencies.

The ATMSi and IMTMC/S projects have provided essential, pivotal support to other regional Showcase projects through common design, engineering, and integration assistance for the IMTMS network. The intricacy of the relationships with other regional and inter-regional Showcase projects has introduced complex dependencies that have caused periodic delays to the development of the ATMSi and IMTMS network.

The IMTMC/S project is being conducted under a task order contract for \$8,402,209 and was funded by a variety of grants derived from federal, state, and local sources. Among the current delays to progress on the project, is the interruption in the approval of Work Order 6, which will allow the system developer to complete the ATMSi component of the IMTMC/S project. Approval of the work order is pending the resolution of continuing funding uncertainties.

The IMTMC/S project's impact to the competitive environment in San Diego will be unclear until the systems are fully deployed. Documentation and standards that can be easily accessed and applied by future system developers will assist in maintaining healthy competition in the region.

The IMTMC/S, ATMSi and regional ITS have benefited from regional collaboration in project planning and implementation, and have been challenged by changes in local agency responsibilities. Continuing progress and ultimately closure on this phase of the project will be achieved through strong project management, clear identification and application of funding, and expedited approval of current the work order. Previous delays in the project have resulted in changes in scope over time to accommodate continuously evolving and improving technology.

The evaluation has identified some potential actions to assist in mitigating delays that inhibit project progress. The following recommendations are general and are potentially applicable to any project with similar regional application and organization structure:

- Adoption of a project management standard that includes a structured deliverable document review process – the outcome would be more efficient and expedited deliverable document review cycles.
- Suitable work load adjustments for public agency staff responsible for technology project management – adoption of a project management standard would allow more accurate estimates of time required to monitor and manage a technology project.
- Allocation of time for project managers to attain an appropriate level of technical expertise with regard to their project's systems, software, or hardware – historically project managers

have not had enough time to come up to speed on their project technologies in addition to conducting their regular project management tasks and deliverable reviews. Alternatively, agencies could provide the project managers with appropriate support staff possessing the applicable technical expertise to support the management of projects of this type.

- Consensus building, procedure development, and policy formation, are time consuming factors in the design, development, and deployment of regional projects that include multiple agencies and jurisdictions. Subsequent projects in the San Diego will benefit from the regional architecture completion. Groundbreaking consensus building has already occurred with this project, RAMS, Mission Valley Event Management (MVEM), and others. Few previous precedents or models were available for projects of these types; now that the San Diego area has regional, cross-jurisdictional projects that have undertaken these challenges, the policies, procedures, and consensus-building lessons learned should be reemployed in future projects.

Additionally, based on project partner recommendations, the following elements have been identified as essential in ensuring the success and usefulness of this and future regional transportation technology projects:

- Expedited turn-around on work order approvals,
- Expedited turn-around on deliverable reviews and approvals,
- Frequent multi-phase acceptance testing to assist with project understanding,
- Strong support from regional leaders, encouraging interest and use from operations management and staff,
- Consistent involvement of operations staff in the development process,
- Strong project financial management, and
- Organized deliverable document archiving.

Appendix A – IMTMC/S-ATMSi Interview Guide

Measure 1.1.1 (The System Development Process)

NET/SANDAG/Caltrans

1. When did the project kick-off?
2. Was a Concept of Operations (ConOps) developed during the project? If so, at what point, and who was involved in its development?
3. What other deliverables were developed and on what date was each one finalized?

Measure 1.2.1 (NA)

Measure 1.2.2 (NA)

Measure 1.2.3 (Compatibility)

Caltrans (system operator)

1. Have there been any indications of interference or incompatibility between your legacy system(s) and the IMTMC/S-ATMSi system?

Measure 1.2.4 (Scalability)

NET (system developer)

1. Please describe the system's architecture – both software and network design.
2. How many additional affiliates can the system support?

Measure 1.3.1 (Impact of Showcase Integration on Individual Projects)

NET/SANDAG/Caltrans

1. What was the IMTMC/S-ATMSi's originally contracted period-of-performance (POP)?
2. To what extent did integration with the Kernel or other Showcase projects impact the IMTMC/S-ATMSi's design and/or schedule?
3. Did your agency procure any hardware or software for the Showcase Program on behalf of the Priority Corridor? If so, please list the items and their estimated costs. Also indicate if these are one-time costs or ongoing (monthly) costs.
4. Were there any other unplanned hardware/software/enabling technology purchases or upgrades that resulted from Showcase? (For example, required yet unexpected upgrades to databases, radios or other systems). Please list them.
5. Were there any other unusual technical issues or concerns created by Showcase that impacted your project? If so, what actions did you take to deal with them?
6. Were there any institutional issues, preferences or concerns created by Showcase that impacted your project?
7. What were the most important lessons learned from the IMTMC/S-ATMSi project?

Measure 2.1.1 (“Design Once, Deploy Many Times”)

NET/SANDAG/Caltrans

1. Do you feel that “Design once; deploy many times” has been achieved? Why or why not?

Measure 2.2.1 (O&M costs (labor, utilities, space, etc.))

NET/SANDAG/Caltrans

1. Who sets the agency’s O&M budget, and what is the procedure for requesting a budget change (i.e., for getting a new system included into the annual O&M budget)?
2. Please estimate or provide the documented monthly totals associated with each of the following:
 - a) labor hours for technicians to operate/maintain the IMTMC/S-ATMSi system.
 - b) electric utility costs associated with operating IMTMC/S-ATMSi.
 - c) telecommunications costs associated with operating IMTMC/S-ATMSi.
 - d) cost of office space that IMTMC/S-ATMSi equipment occupies.
 - e) labor hours spent on maintenance of the IMTMC/S-ATMSi system.
 - f) cost of replacement hardware/software associated with maintenance activity.
 - g) ongoing costs for software licenses.

Measure 3.1.1 (Changes in O&M procedures/policies)

NET/SANDAG/Caltrans

1. Did your agency change any of its policies or procedures as a result of the IMTMC/S-ATMSi?

2. Operations

- a) Have you discontinued any tasks or activities that you used to perform because of the IMTMC/S-ATMSi?
- b) Has the IMTMC/S-ATMSi impacted how you deal, communicate or coordinate with other agencies (such as local traffic departments, transit providers, law enforcement, media, ISPs, etc.)?
- c) Has the IMTMC/S-ATMSi impacted how other agencies (such as local traffic departments, transit providers, law enforcement, media, ISPs, etc.) deal, communicate or coordinate with you?

3. Maintenance

- a) For how much of the IMTMC/S-ATMSi system are your maintenance staff responsible (workstation hardware/telecommunications connection/software)?
- b) Did your maintenance staff require any special hardware or software training for IMTMC/S-ATMSi?
- c) Did the IMTMC/S-ATMSi system replace any legacy systems that you no longer need to maintain?

Measure 3.2.1 (Staff changes)

NET/SANDAG/Caltrans

1. Were any staff hired (either directly or under contract), fired, or reassigned as a result of the IMTMC/S-ATMSi? If so, how many?

Measure 3.2.2 (Number of hours of staff training)

See Measure 4.2.1

Measure 3.2.3 (Job classifications created/deleted)

SANDAG/Caltrans

1. Has IMTMC/S-ATMSi impacted the job titles, responsibilities and/or pay of any of your operations staff members?

Measure 3.2.4 (Change in employee turnover rate)

SANDAG/Caltrans

1. Has the IMTMC/S-ATMSi system affected your employee turnover rate?

Measure 3.3.1 (NA)

Measure 3.3.2 (Number of ITS standards implemented)

NET (system developer)

1. Were any ITS standards implemented in the IMTMC/S-ATMSi system?

Measure 3.4.1 (Number of agencies involved in transportation & traveler information management)

NET/Caltrans

1. How many agencies generate, manage, and/or exchange data using the IMTMC/S-ATMSi system?

Measure 3.5.1 (Impact of Showcase on local planning)

NET/SANDAG/Caltrans

1. Was an IMTMC/S-ATMSi-like system (it may not have been called by this name at the time) originally called for in the Regional Transportation Plan? If not, has it been added to the plan? Explain.
2. Has either support or expansion of IMTMC/S-ATMSi been included into state or local improvement plans?
3. As far as you are aware, have any other public plans been modified as a result of either the IMTMC/S-ATMSi or Showcase? Explain.
4. As far as you are aware, has the execution of any other plans been temporarily or permanently postponed as a result of either the IMTMC/S-ATMSi or Showcase? Explain.
5. Has an effort been made to inform other planners and policy makers - who may not know about IMTMC/S-ATMSi or Showcase - about the projects? Explain.
6. Did you forego any other transportation improvements in order to fund your agency's involvement in either the IMTMC/S-ATMSi or Showcase? Explain.
7. Was equipment was installed at your agency as a result of the IMTMC/S-ATMSi/Showcase? If so, is there anyone at your agency who is responsible for maintaining an inventory or architecture of that installation?
8. Were any policies (such as procurement policies, business plans, operations policies, etc.) within your organization enacted, revised or dropped as a result of either the IMTMC/S-ATMSi or Showcase?

Measure 3.5.2 (Impact of both public and private sector policy decisions on Showcase projects)

SANDAG/Caltrans

1. Who sets the policy with regard to IMTMC/S-ATMSi and/or other transportation management and information systems?
2. Are there, or have there been, any policy decisions that affect the use, marketing, operation, maintenance, or expandability of IMTMC/S-ATMSi?

Measure 4.1.1 (Change in number of information exchanges (quantity))

SANDAG/Caltrans

1. Have there been any new information or data exchange capabilities enabled through the implementation of the IMTMC/S-ATMSi system? Has there been a change in the volume of information or data exchanged through existing capabilities between participating agencies or the public?

Measure 4.1.2 (Change in communications quality (timeliness and quality of data exchanged))

SANDAG/Caltrans

1. For those ISPs that share their own data with the public sector, would you say that their data is of better quality, about the same, or of lesser quality than what the public sector collects? Please explain.

Measure 4.1.3 (Number of new ITS system architecture data flows implemented)

Measure 4.2.1 (Change in agency performance as a result of Showcase)

SANDAG/Caltrans

1. How much money do you estimate you save through the use of the IMTMC/S-ATMSi system? Are there other efficiencies or performance enhancements that you have gained through the use of the IMTMC/S-ATMSi system? Please explain.
2. Can you share any examples of favorable or unfavorable feedback from patrons or system operators regarding the systems and devices implemented through IMTMC/S-ATMSi?

Measure 4.3.1 (NA)

Measure 4.3.2 (NA)

Measure 5.1.1 (NA)

Measure 5.1.2 (NA)

Measure 5.2.1 (NA)

Measure 5.2.2 (NA)

Measure 5.3.1 (NA)

Measure 5.3.2 (NA)

Measure 5.3.3 (NA)

Measure 5.4.1 (NA)

Measure 5.5.1 (NA)

Measure 5.5.2 (Change in transit agency's operational efficiency)

SANDAG/MTDB

1. Do you feel that IMTMC/S-ATMSi has helped boost ridership?

Measure 5.5.3 (Change in select operating costs)

SANDAG/MTDB

1. Has the IMTMC/S-ATMSi helped you save money on operations?

Measure 5.5.4 (Number of staffing changes required)

See Measures 3.2.1, 3.2.3, 3.2.4

Measure 5.6.1 (NA)

Endnotes/References

Endnotes

¹ ISTEA requires that “operational tests utilizing federal funds have a written evaluation of the Intelligent Vehicle Highway Systems technologies investigated and the results of the investigation.” Although Showcase is not officially an operational test, it deploys and demonstrates ITS services, functions, and technologies under “real world” conditions, similar to an operational test.

² California Statistical Abstract, Table B-4. California Department of Finance, Sacramento, CA. December 2003.

³ California Statistical Abstract, Table J-4. California Department of Finance, Sacramento, CA. December 2003.

References

System High Level Design, Intermodal Advanced Transportation Management System (ATMSi); Regional Intermodal Transportation Management System (IMTMS); National Engineering Technology Corporation, September 2004.

Federal Work Plan: Intermodal Advanced Transportation Management System (ATMSi) – Phase 2 Development, Final. National Engineering Technology Corporation/BRW, Inc. September 2003.

Project Deliverables, Forbearance, and Invoice records: Microsoft Access database file. Caltrans District 11, versions as of August 2004 and October 2004.

Project Deliverables Base Contract and Amendments 1-3: Microsoft Excel spreadsheet files. National Engineering Technology Corporation. October 2004.

Project Deliverables Work Order 4: Microsoft Excel spreadsheet files. National Engineering Technology Corporation. October 2004.

Work Order 6 Tasks and Schedule: Microsoft Project file. National Engineering Technology Corporation. October 2004.

IMTMS Governance: Microsoft Power Point presentation. National Engineering Technology Corporation. November 2003.

IMTMS Overview, Final: Microsoft Power Point presentation. National Engineering Technology Corporation. October 2003.

ATMS Documentation Summary. National Engineering Technology Corporation. October 2004.

ATMS V2 Port and ATMSi Status Summary. National Engineering Technology Corporation. June 2003.

Release 1 Procurement List. National Engineering Technology Corporation. June 2003.

Release 2 Procurement List, Revision 3. National Engineering Technology Corporation. June 2003.

Software Change Summary Report. National Engineering Technology Corporation. April 2003.